Texcom Gulf Disposal, LLC
WDW-410
Well Perforating and Testing Report

Submitted To:

Texas Commission on Environmental Quality

Office of Permitting and Registration
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Final

Introduction

TexCom Gulf Disposal, LLC (TexCom), applied to the Texas Commission on Environmental Quality (TCEQ) for a Class V permit to conduct the re-perforation and well testing of TCEQ previously permitted Underground Injection Control (UIC) well WDW-315 which is proposed to be permitted as UIC Class I injection well WDW-410. The approval was granted on July 23, 2009, by the TCEQ as TCEQ Authorization No. 5X2700064.

Texcom hired ALL Consulting (ALL) to supervise the work on the well and to conduct the analysis of the results. The work included staging frac tanks on location and filling with brine water for the injection test, supervising the re-perforation of the well, setting up and supervising the mechanical integrity testing of the well, supervising the injection fall off testing of the well, and analyzing the results of the fall off testing. This report covers the work conducted on WDW-410. All the work activities were conducted starting September 8, 2009, and ending September 15, 2009.

Well Activities Daily Summaries

Prior to the start of well perforating and testing activities, Gulf Coast Vacuum Service brought in 15 frac tanks and filled them with clean brine from Texas Brine Corporation. The brine weight was 9.9 pounds per gallon based on calculations from the well pressure gradient. A total of 7,500 bbl were on site for the testing work.

September 8 - ALL arrived on site at 7:00 AM to supervise the rig up of equipment. Wood Group Logging (WGL) arrived and rigged up on WDW-410 to start perforating activities. An initial correlation log was run from total depth of 6,418 feet up to 4,990 feet. This log was then correlated with the perforating log from the original perforating work when the well was drilled. These logs were also correlated with the open hole logs on the well. Once the correlation was complete, WGL started picking up the perforating equipment and making multiple runs into the well to perforate. WGL made a total of 17 runs into the well to perforate. After perforating, the well was shut in for the night.

September 9 - Torqued-Up Energy Services (TES) arrived on location and started rigging up to conduct a nitrogen backwash and acidization on WDW-410. TES rigged up and ran in the hole with coil tubing to top of perforations. TES started injecting nitrogen as they moved down hole to total depth. They continued to cycle the coil across the injection interval as they jetted with the nitrogen. After jetting for about four hours, a total of 450 barrels of formation fluid had been collected along with some sand and shale particles. TES then rigged down the nitrogen and started pumping the acid treatment via the coil tubing. TES pumped 5,000 gallons of acetic acid along with various surfactants and corrosion inhibitors through the coil tubing and into the

formation. TES continued to cycle the coil tubing across the perforations as the acid was pumped. After pumping the acid, the well was shut in for one hour to allow for the acid to spend itself near the wellbore. After an hour the acid was pumped away and the coil tubing removed from the well. The well was shut in and secured for the night.

September 10 - WGL arrived on site and started to prepare for the annulus pressure test (APT) and the radioactive tracer survey (RTS). The APT tools were hooked up to the annulus and WGL started pressuring up the annulus to 1,532 psi. The pump was isolated from the pressure tool and the annulus was monitored for 30 minutes. After thirty minutes the pressure had dropped to 1,528 psi and passed the APT. The APT tools were rigged down and the RTS tools were rigged up. WGL ran in hole with the RTS tools and conducted the RTS. TES pumped at rates of 1.5 and 3 bpm as needed during the RTS. Two representatives from the TCEQ were on site for all the mechanical integrity testing and approved all the work that was conducted. Once the RTS was complete, WGL rigged down the RTS tools and rigged up the bottom hole pressure (BHP) tools. WGL lowered a surface readout and memory BHP tools into the well and set them at 6,000 feet below ground level. The tools were allowed to temperature stabilize for about an hour and then TES started injecting in the well at 3 bpm. After about 45 minutes, injection was shut in and a leak in the lubricator was repaired. Injection was then restarted. Injection continued overnight at a steady 3 bpm while being monitored by the BHP tools.

September 11 - Injection continued into the well through out the day. The rate stayed at 3 bpm.

September 12 - At approximately 6:00 am, after approximately 36 hours of injection, pumping was stopped and the well shut in to monitor the pressure fall off in the injection well. TES rigged down their pumping equipment and left location. WGL continued to monitor the BHP for the next few days.

September 13 - WGL continued to monitor the pressure decay in the well.

September 14 - WGL continues to monitor the pressure decay in the well.

September 15 - WGL arrived at the site to rig down the BHP equipment. The tool was pulled from the well making stops every 1,000 feet to determine the fluid weight of the injection fluid. WGL rigged down their equipment and left location. The well was secured and the monitoring systems checked. The frac tank company removed the frac tanks from location.

Well Perforating

On September 8, 2009, WGL rigged up to perforate WDW-410. The perforating followed the procedure set forth by TexCom in the permit application which consisted

of adding new perforations in the existing perforated interval as well as adding an additional 45 feet of perforations. WGL conducted a correlation log on the well prior to perforating to match the depths on their truck to the original depths used for perforating when the well was drilled (Appendix A). The new log was correlated to the well log ran when the well was originally perforated. Once the correlations were made, WGL initiated the perforating process. The well was perforated as shown below:

Table 1 – WDW-410 Perforations

Perforated Interval	Feet	Shots per Foot
6046 – 6048	2	6 spf – New Perfs
6052 – 6056	4	6 spf – New Perfs
6074 – 6084	10	6 spf – New Perfs
6136 – 6148	12	6 spf – New Perfs
6164 – 6182	18	6 spf – New Perfs
6202 – 6218	16	4 spf
6230 – 6245	15	4 spf
6250 – 6262	12	4 spf
6290 – 6298	8	4 spf
6302 – 6308	6	4 spf
6312 – 6340	28	4 spf
6375 – 6390	15	4 spf

Nitrogen Backwash and Acid Treatment

On the morning of September 9, 2009, TES rigged a coil tubing unit and associated equipment on WDW-410 to conduct a nitrogen backwash and acid treatment. The purpose of the coil tubing work was to backflow the perforations to remove any debris and clean up the perforations to the highest extent possible. The tubing was run into the well and nitrogen was pumped into the well to flow the formation fluids out of the well and into an open-top tank. The coil was cycled across the perforations during the operation to obtain the maximum cleaning of the well. A total of approximately 450 barrels of fluid were back flowed out of the well. The fluid and solids that were removed from the well were trucked to an industrial disposal facility that was licensed to accept waste fluids form an industrial facility.

Once the backwash was complete, TES pumped 5,000 gallons of Acetic Acid along with various surfactants and polymers down the coil tubing and placed the acid across the perforations. The coil was cycled up and down during the acid treatment to ensure maximum placement across the perforations. After pumping the acid was displaced

from the coil and allowed to sit in the perforations for about one hour. At the end of the hour, the acid was flushed from the well with 40 barrels of brine and the coil was pulled from the well. TES rigged down their coil tubing and left location.

Mechanical Integrity Testing

Annular Pressure Test

On the morning of September 10, 2009, WGL rigged to conduct an annular pressure test on WDW-410. A quartz pressure gauge was attached to the annulus of the well and then the annulus was pressured up using a small pump. The pressure data was recorded on the computer during the test. The well was pressured up to 1533 psi and monitored for 30 minutes. The well pressure declined to 1528 psi during the testing. This was a loss of less than 1% which shows the well has mechanical integrity. After the testing, the pressure was released and the tools removed from the wellhead. Table 2 below provides the information collected by the pressure tools during the annular pressure test. A copy of the bottom hole pressure testing tool certification is located in Appendix B.

Table 2 - Annular Pressure Test

Time	Pressure	Time	Pressure	Time	Pressure
7:51:17	1533.25	8:01:17	1530.90	8:11:17	1529.32
7:51:47	1533.12	8:01:47	1530.83	8:11:47	1529.25
7:52:17	1532.98	8:02:17	1530.74	8:12:17	1529.20
7:52:47	1532.84	8:02:47	1530.67	8:12:47	1529.13
7:53:17	1532.71	8:03:17	1530.60	8:13:17	1529.05
7:53:47	1532.59	8:03:47	1530.56	8:13:47	1528.98
7:54:17	1532.47	8:04:17	1530.50	8:14:17	1528.92
7:54:47	1532.35	8:04:47	1530.45	8:14:47	1528.86
7:55:17	1532.24	8:05:17	1530.40	8:15:17	1528.83
7:55:47	1532.12	8:05:47	1530.35	8:15:47	1528.78
7:56:17	1532.00	8:06:17	1530.28	8:16:17	1528.73
7:56:47	1531.89	8:06:47	1530.19	8:16:47	1528.68
7:57:17	1531.79	8:07:17	1530.06	8:17:17	1528.61
7:57:47	1531.69	8:07:47	1529.95	8:17:47	1528.54
7:58:17	1531.57	8:08:17	1529.83	8:18:17	1528.48
7:58:47	1531.47	8:08:47	1529.72	8:18:47	1528.42
7:59:17	1531.34	8:09:17	1529.66	8:19:17	1528.38
7:59:47	1531.23	8:09:47	1529.56	8:19:47	1528.37
8:00:17	1531.11	8:10:17	1529.48	8:20:17	1528.32
8:00:47	1531.00	8:10:47	1529.40	8:20:47	1528.28
				8:21:17	1528.24

Radioactive Tracer Survey

After completion of the annular pressure test, WGL rigged up and ran in hole with the radioactive tracer survey (RTS) tools. The tools were run into the well to total depth and a base log was run from 6,576 feet to 4,900 feet. The tool was then positioned at 4,960 feet and a slug of RTS material was ejected while the well was injected into at 1.5 bpm. The tool was lowered through the slug and then logged back up through the slug to watch the flow down the well. A total of 4 logging runs were made through the slug before it dissipated into the formation. The tool was then raised back up to 4,960 feet and the logging runs were repeated until the second slug dissipated into the formation. The tool was then positioned at 6,026 feet (20 feet above the perforations) and two stationary surveys were conducted by ejecting a slug and monitoring the well with the tool stationary. Each survey was for 15 minutes. After the last stationary survey, the tool was lowered to 6,558 feet and the final base log was run back to 4,900 feet.

The results of the RTS indicate that all the injected fluid is travelling down the well and exiting the well within the injection interval. No upward migration of the fluid was noted in the survey. The well passed the mechanical integrity testing as prescribed by TCEQ. Two TCEQ representatives were on site during the testing to witness the work being conducted. A copy of the RTS log is provided in Appendix C.

Injection/Fall-off Testing

After completion of the mechanical integrity testing, WGL rigged up the bottom hole pressure monitoring equipment and lowered the tools into the well. The tools were set up with a memory pressure tool located beneath surface readout pressure gauges. The tools were lowered into WDW-410 and set at 6,000 feet below ground surface. The tools were allowed to temperature stabilize for about an hour before injection was commenced. TES rigged up to the wellhead and initiated injection into the well at 3 bpm. The injection pressure was zero for the first 30 to 40 minutes while the formation and well filled up. After about one hour the well started to build a little pressure and the wireline lubricator started to leak. The injection was shut down and the tool pulled to allow for the lubricator to be fixed.

After sealing the leak, injection was restarted into the well. The pressure increased to around 100 psi before a second leak was noticed. The injection was shut down for a few minutes to repair the leak. The injection was then restarted and continued at 3 bpm for the next 35 hours. The injection pressure fluctuated between 170 psi and climbed as high as 200 psi during the injection test. After approximately 36 hours of injection, the pumps were shut down and the well shut in to monitor the injection pressure fall off.

After injection, TES rigged down and left location. WLG remained on location for the next 72 hours while the pressure response was monitored and recorded by the down hole equipment. At the end of approximately 75 hours of fall off, the tools were removed from the well making gradient stops every 1,000 feet on the way out. After removing the tools from the well, the data was downloaded from both the memory tool

and the surface readout tools. WGL rigged down their equipment and left location. The well head valves were set to monitor the well as before and all work was complete. Copies of the injection rate data and the fall off pressure data are included in the data disk that is attached to this report.

Bottom Hole Pressure Fall-off Analysis

The results of the analysis of the bottom hole pressure testing indicated a permeability of 190.6 millidarcies with a skin factor of 22. The high skin factor indicates that there is some near well formation damage or clogging of the perforations that was not effectively removed by the well backwash or acid treatment. This high skin factor impacts the analysis of permeability by reducing the effectiveness of the communication of the pressure response with the wellbore. The complete analysis of the results of the injection fall-off testing is provided in the attached report – WDW-410 Bottom Hole Pressure Testing Report which is located in Appendix D.

Area of Review

Once the results of the testing were analyzed and the permeability determined, the permeability value was inserted into the previously used well model to determine the pressure response in the formation based on the permeability of 190.6 md. The model used was the same model that had been used to calculate the pressure response during the last round of modeling at 80.9 md and a closed fault. This latest modeling was done under the condition of the fault located to the south being a closed fault and allowing no fluid movement across the fault. Injection was simulated at maximum rate of 350 gpm with continuous injection for 30 years. The following plots show the pressure response in the Lower Cockfield sand after 30 years of continuous injection.

Figure 1 – WDW-410 Reservoir Pressure
190.6 md, 350 gpm, 30 years injection

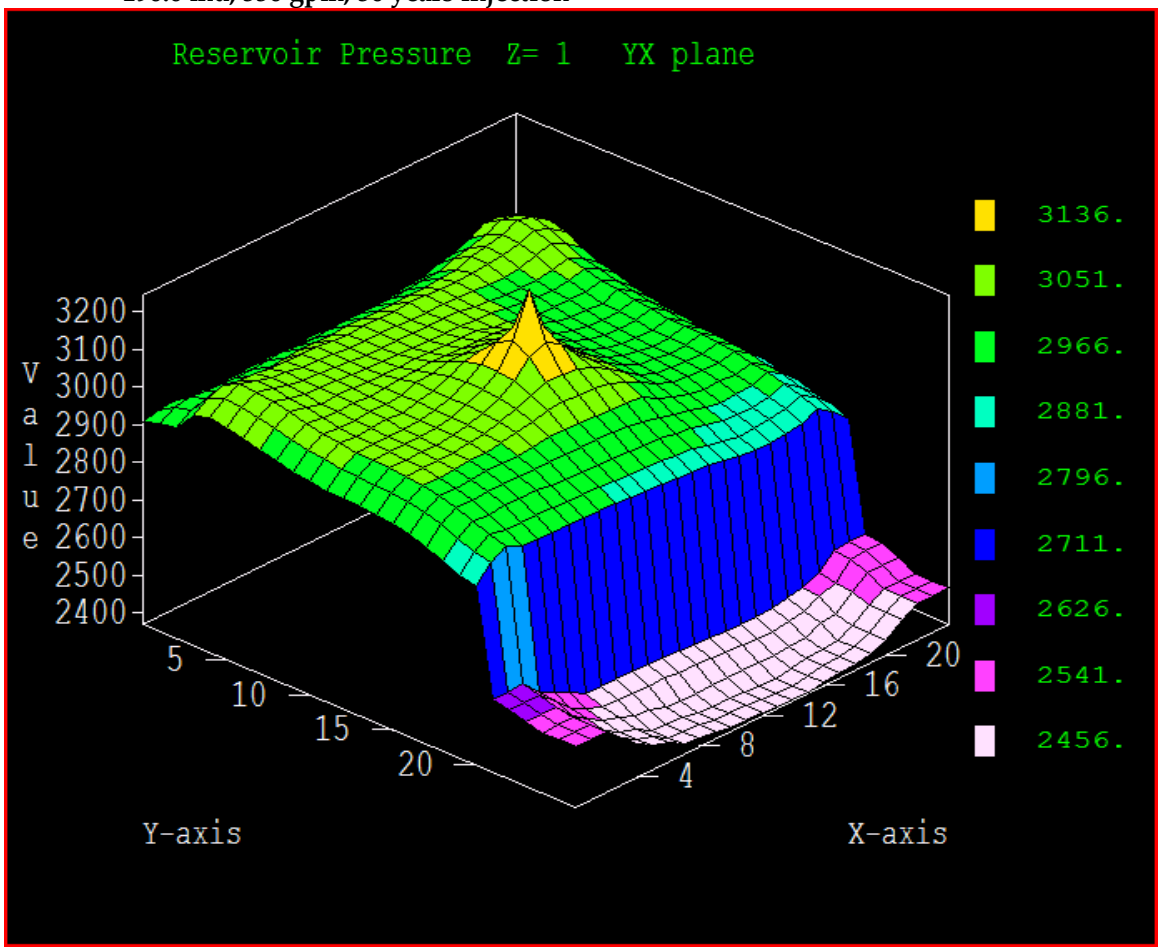

Figure 2 – WDW-410 Reservoir Pressure
190.6 md, 350 gpm, 30 years injection

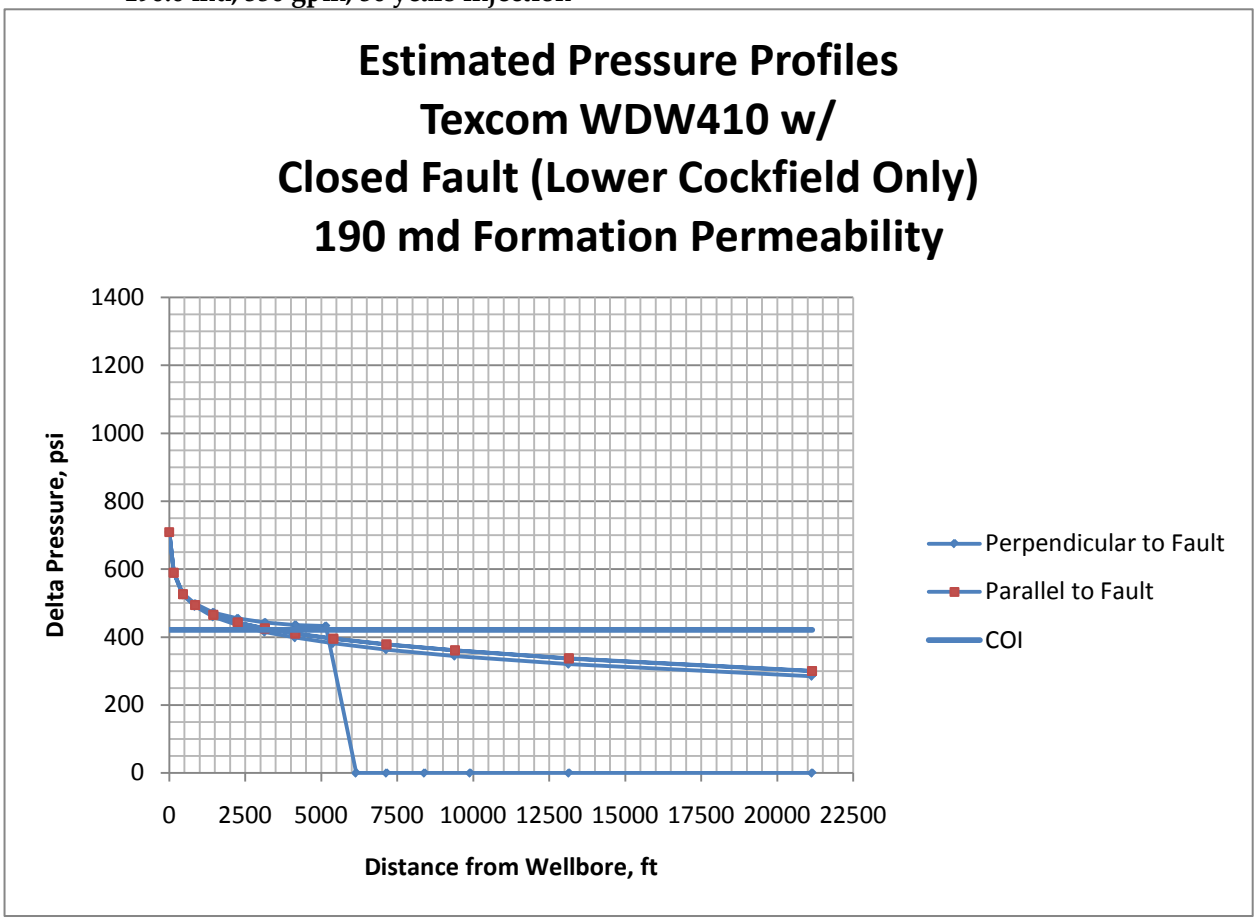

Figure 2 indicates that the pressure increase in the reservoir will create a cone of influence of approximately 3,500 feet east and west of the well and 3,250 feet north of the well. The pressure will stay above the cone of influence pressure (421 psi) between the well and the fault to the south. Therefore the Area of Review (AOR) for the well under this scenario is the 2.5 mile AOR originally prepare in the initial application for WDW-410.